

CATARACT AND POSTERIOR SEGMENT RISK FACTORS

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Abstract

Purpose: To determine the prevalence of posterior segment pathology in patients with cataract at a tertiary care centre in south India and its implications on visual prognosis.

Materials and Methods: A retrospective study conducted over a period of one year from April 2013 to April 2014 at MOH, Bangalore, South India. In this study, all patients' admitted in our centre for cataract underwent a detailed fundus evaluation and those precluding visualization of fundus underwent B-scan ultrasonography. There were seen an association of certain ocular and systemic risk factors with high incidence of abnormal posterior segment. These systemic and ocular risk factors were assessed and odds ratio for posterior segment pathology was calculated in these eyes with cataract.

Results: Of the 1236 eyes assessed, 815 eyes had evidence of posterior segment pathology based on history, detailed fundus examination and ultrasound. Most frequent retinal pathology detected was myopia. Among patient factors, diabetes was seen to be associated with higher incidence of posterior segment pathology. Among ocular features, posterior synechiae, glaucoma, uveitis were associated with high incidence of posterior segment pathology. Only 26 eyes exhibited posterior segment pathology without any of the above mentioned features

Conclusion: Pre-operative evaluation of Posterior Segment in all cataractous is essential to detect the pathologies which help the surgeon to deduce a surgical plan/strategy for the procedure.

This study enabled us to assess the prevalence of posterior segment pathologies in patients who were admitted for cataract surgery and also identified the pathologies which required evaluation and management in our vitreo retinal department after cataract surgery. It also helped us to counsel the patient about the visual outcome after surgery.

Keywords: Cataract, Posterior segment, South India.

Introduction

India has signed to be a part of World Health Organization (WHO) resolution on **Vision 2020: The right to sight**. Cataract has been proven itself to be the most significant cause of bilateral blindness in India (accounting for more than 61% of above 50 years age group blindness) where vision is lesser than 20/200 in the better eye on presentation. From around 1.2 million cataract surgeries per year in the 1980s, the cataract surgical output increased to 3.9 million per year by 2003. Recent data from the WHO shows that there is a 25% decrease in blindness prevalence in India. This could be due to the increased cataract surgeries in the country.¹

Posterior segment pathologies in cataractous eyes has remained a topic without extensive studies being done. However, studies related to evaluation of the posterior segment using ultrasonography have been done. Hence this study was undertaken. We evaluated all patients admitted in our hospital for cataract to determine number of patients with posterior segment pathology and to segregate those patients who required intervention post cataract surgery. It is of much importance to view the fundus prior to cataract extraction not only to predict the visual outcome but also to diagnose and manage conditions such as diabetic retinopathy, retinal tears etc., B-scan Ultrasonography (USG) can be used to diagnose gross pathologies such as retinal detachment, posterior staphyloma and vitreous hemorrhage. Finer pathologies are difficult to assess. Fundus examination of the fellow eye may provide contributions in some cases of bilateral lesions only². The results of cataract surgery should not be unduly overrated without proper examination of the posterior segment as Best Corrected visual acuity (BCVA) can vary drastically with lesions in the posterior segment. In the present study, we aim to

assess undiagnosed posterior segment pathologies in eyes with cataract which pose difficult and challenging fundus examination.

Aim and Objective

Aim: To assess the prevalence of posterior segment pathology in patients undergoing cataract surgery.

Objective: To identify the retinal pathologies requiring further management following cataract surgery.

Materials and Methods

Inclusion Criteria

All patients admitted in our centre for cataract surgery irrespective of age.

Exclusion Criteria

Traumatic and developmental cataracts

This retrospective descriptive clinical study was carried out at a tertiary care centre, Bangalore, South India over a period of one year from April 2013 to April 2014. All registered patients underwent a preoperative protocol starting from detailed history, visual acuity at the time of presentation, detailed dilated fundus examination with indirect ophthalmoscope at bedside and those eyes with dense and mature cataracts in which fundus was not visible or was obscured were evaluated with B-scan USG under guidance of trained personnel.

Significant posterior segment pathology was defined as those conditions likely to affect visual outcomes⁷

All myopic degenerations were considered in the study (which included high myopes with axial length greater than 26.5mm)².

Diabetic retinopathy was classified according to Early Treatment Diabetic Retinopathy Study (ETDRS) which included the Non proliferative Diabetic Retinopathy (NPDR), NPDR with Clinically Significant Macular Edema (CSME) and Proliferative Diabetic Retinopathy (PDR)¹⁰. Age Related Maculopathy (ARM) and Age Related

Macular Degeneration (ARMD) were also involved in this study based on definition by International ARM Epidemiological Study Group¹¹.

All optic disc changes related to glaucoma were also included [with and without elevated Intraocular Pressure (IOP)]

Association between cataract and posterior segment pathology was tested using ODDS RATIO (OR) with 95% confidence interval. The chi square test was used for analysis and the value of $p < 0.05$ was considered significant.

Results

A total of 1236 eyes of 1236 patients (620 female + 616 male) were included in the analysis. The Mean (SD) age of the 1236 patients was 56.7+/- 13.6 (Range: 17-88.)

8 patients were one eyed. Totally 815 (66%) had evidence of Posterior Segment (PS) pathology as evaluated by detailed fundus examination and B-scan ultrasonography. These patients had associated risk factors like Diabetes Mellitus, Myopia, glaucoma related optic disc changes, uveitis (including anterior, intermediate and posterior uveitis). 100 patients were found to have no abnormal posterior segment pathology which included those patients with reasonable preoperative good vision and those patients with poor vision due to

strabismus, amblyopia and corneal pathologies.

Most common findings were Diabetic retinopathy -228 (20%), Glaucoma related optic disc changes -176 (14.2%), ARMD-170 (13.7%), Myopic macular degeneration -72 (6.2%)

Other posterior segment findings included:

Retinal detachment (RD)-64(5.6%) [Rhegmatogenous RD (RRD)- 58 +Tractional RD (TRD) - 6], Vitreous hemorrhage (VH) -40 (3.2%), TRD associated with VH -3 (0.2%), Chorioretinal coloboma -3(0.2%), Posterior staphyloma-3(0.2%) and Asteroid hyalosis -4 (0.3%)

Systemic risk factors were defined as those systemic diseases which contributed to retinal abnormalities/pathologies leading to significant visual disturbances namely Diabetes and Hypertension

Ocular risk factors were defined as those local factors contributing to retinal abnormalities/pathologies leading to significant visual disturbances, namely ARMD, Myopia, Vein occlusions, Macular hole, Glaucoma, Posterior uveitis Chorioretinal colobomas and Posterior staphylomas.

However, traumatic cases and developmental cataract cases were excluded in the study.

Table 1: Frequency of posterior segment pathology: causes for poor visual acuity after cataract surgery and their correlation with posterior segment pathology is enlisted in the following table

<i>PATHOLOGY OBSERVED</i>	<i>NUMBER OF PATIENTS</i>	<i>FREQUENCY</i>
DIABETIC RETINOPATHY	228	20 %
NPDR with Maculopathy	077	8.1 %
NPDR without Maculopathy	102	9.1%
PDR	049	3.8%
PDR with VH	040	3.2%
PDR with TRD	006	0.4%
PDR with TRD +VH	003	0.2%
HYPERTENSIVE	076	6.6%

RETINOPATHY		
Grade 1	020	1.7%
Grade 2	030	2.6%
Grade 3	022	1.9%
Grade 4	004	0.3%
MYOPIC DEGENERATION	072	6.2%
With maculopathy	008	0.5%
With CNVM	003	0.2%
ARMD	170	14.9%
Dry	128	10.3%
Wet	042	3.6%
POSTERIOR STAPHYLOMA	003	0.2%
RETINAL DETACHMENT	064	5.6%
RRD	058	5.1%
TRD	006	0.5%
RD with posterior staphyloma	003	0.2%
RD with choroidal coloboma	004	0.3%
GLAUCOMA	176	15.4%
With /without increased IOP		
RETINAL DYSTROPHY	010	0.8%
Retinitis Pigmentosa		
MACULAR HOLE	004	0.3%
VASCULAR OCCLUSIONS	012	0.9%
Branch vein occlusion		

Table 2: Posterior Segment Abnormalities and Their Incidence

POSTERIOR SEGMENT ABNORMALITY	NUMBER OF PATIENTS (n=1236)	PERCENTAGE	ODDS RATIO(95% CI)	'p' value
Diabetic Retinopathy	228	20	17.3 (9.9-21.3)	0.036
Hypertensive Retinopathy	076	6.6	2.7 (0.5-12.5)	0.368
Myopic degeneration	072	6.2	2.2 (0.2-12.1)	0.310
Age Related Macular Degeneration	170	14.9	13.7 (7.2-18.8)	0.002
Retinal Detachment	064	5.6	5.2 (4.1-6.9)	0.004
Glaucoma	176	15.4	14.7 (11.3-20.1)	0.003

Posterior segment abnormalities detected by ultrasound was seen in 680 eyes.

We also noted the frequency of posterior segment pathology in relation to risk factors

and also the prevalence of posterior segment abnormality in all the cataractous eyes (See Table 3)

Table 3

	<i>NUMBER OF PATIENTS</i>	<i>PERCENTAGE</i>
CATARACT WITH POSTERIOR SEGMENT ABNORMALITY	815	66
UNILATERAL CATARACTS	240	19.4
Less than 50 years	176	14.2
More than 50 years	064	5.1
BILATERAL CATARACTS	996	80.5

Table 4: Association of risk factors with posterior segment abnormalities

	Number of patients
Patients with posterior segment pathology	815
Having no risk factors with posterior segment abnormalities	026
Having risk factors with no posterior segment abnormalities	200

Our study also revealed that bilateral cataracts were almost four times commoner compared to unilateral cataracts. Also noted was the fact that unilateral cataracts were commoner in the age group below 50 Years. Visual acuity recorded on the first post-operative day helped us to deduce that 298

eyes (24.1%) had a postoperative vision better than 6/12 and 938 eyes (75.8%) had a post-operative vision less than 6/18.

143 eyes had poor visual outcome owing to untreated and unrecognized preexisting posterior segment pathologies.

Table 5: Visual acuity recorded pre-operatively and on first post-operative day pre-operative

<i>VISUAL ACUITY</i>	<i>NUMBER OF EYES</i>	<i>PERCENTAGE</i>
6/9	Nil	
6/12	Nil	
6/18	Nil	
6/24	Nil	
6/36	Nil	
6/60	104	8.4
Counting fingers(1-3 mts)	223	18
Counting fingers(3-6 mts)	090	7.2
Counting fingers-< 1mt	101	8.1
Hand movements	718	58

Table 6: Post-operative day one

VISUAL ACUITY	NUMBER OF EYES	PERCENTAGE
6/9	200	16.1
6/12	098	7.9
6/18	043	3.4
6/24	141	11.4
6/36	372	30
6/60	219	17.7
Counting fingers(1-3 mts)	013	1
Counting fingers(3-6 mts)	007	0.5
Counting fingers < 1 mt	143	11.5

Discussion

Cataract is one of the leading causes of treatable blindness in developing countries like India⁷. Detailed fundus examination is very important to provide accurate prognosis of vision following cataract surgery. Many patients in our country present at advanced stages with markedly reduced vision owing to factors like lack of education and awareness, financial constraints, lack of healthcare facilities, fear of poor outcome amongst others. Also contributing to the above is a myth that cataract should be ripe to seek treatment⁹. These factors are seen to be responsible for the high incidence of advanced cataracts².

Our aim was to assess the prevalence of posterior segment pathology in patients undergoing cataract surgery and also to identify the retinal pathologies requiring further management following cataract surgery. This enabled us to deduce a protocol and strategy in planning cataract surgery with adjunctive treatments for the posterior segment pathologies.

We noted the occurrence of significant posterior segment abnormalities on ultrasonography in 680 (55%) eyes with cataract which was more than the incidence reported in study of Anteby⁶ et al (19.6%) and less than that in the study by Haile and Mengistu⁵, who found 68% incidence of detectable abnormalities. The study by Anteby et al included eyes with ocular

trauma and this could have led to higher incidence of posterior segment abnormalities.

In our study, we included all patients admitted in our tertiary care centre for cataract surgery irrespective of age and that included patients with diagnosed and undiagnosed posterior segment pathologies. We also excluded traumatic cataracts as the visual prognosis was guarded owing to the invariable posterior segment involvement. Developmental cataracts were also excluded as they were found to be associated with some congenital abnormalities that had a different implication on the posterior segment.

In our retrospective analytical study, it was found that main causes of reduced visual acuity were Diabetic Retinopathy followed by ARMD and Glaucoma. We also found that though there were number of myopic patients, myopic maculopathy and choroidal neovascular membrane in myopia contributed significantly to the guarded visual prognosis. Also, myopic chorioretinal degeneration with posterior staphyloma was prognostic in terms of poor visual outcome. It was seen that 815 eyes (66%) required treatment post cataract surgery.

We also found that systemic conditions like diabetes mellitus and hypertension affected bilaterally though not symmetrically. In our study, we found that there were 77 (8.1%) patients with diabetic

maculopathy who required post-surgical management in our Vitreo Retinal department. Also Grade 3 and Grade 4 hypertensives about 26 in number (2.2%) were seen associated with poorer visual outcome. This subsequently helped us in counseling the patient on the post-operative visual outcome and also form a management protocol thereafter. However, progression of preexisting DME is noted²¹ and hence it is mandatory to discuss and counsel the possible adverse visual outcome in such cases.

The ODDS Ratio with 95% Class Interval (CI) for the above patients with abnormal posterior segment are tabulated in Table 2. Abnormal posterior segment were seen to occur significantly in patients' with diabetic retinopathy (p value= 0.036), ARMD (p value=0.002), RD (p value= 0.004) and Glaucoma (p value= 0.003). Hypertensive Retinopathy (p value=0.368) and myopic degeneration (p value= 0.310) were not significantly associated with posterior segment pathology.

ARMD also showed progression after cataract extraction especially dry ARMD and late ARMD^{15,16}

Despite such unfavorable predictions, cataract extraction has to be performed so that further evaluation of the posterior segment can be done by using special retinal imaging.¹⁷

Glaucomatous eyes also showed optic disc changes which are invariably bilateral although asymmetrical. This was also significantly associated with poor post-operative visual outcome. However, post cataract surgery, glaucoma patients were advised for further management in glaucoma clinic.

The other causes of reduced vision were variable as it could not have been predicted by examining fellow eye due to the unilateral presentation of the pathology.

The prevalence of posterior segment pathologies in eyes with cataract has remained a topic without extensive studies being done. However, studies related to the usefulness of ultrasonography in predicting visual outcome prior to cataract surgery are being successfully done.^{4,7} Ultrasonography can be used to diagnose gross pathologies such as retinal detachment, vitreous hemorrhage and posterior staphyloma. Retinal imaging techniques such as optical coherence tomography provide us with valuable information about macular pathology like choroidal neo vascular membrane, macular edema, macular hole etc.,. Dilated fundus examination using indirect ophthalmoscope and slit lamp biomicroscopy help us to assess the finer pathologies provided the ocular media is clear. Fundus examination of the fellow eye may provide information about the posterior segment in some cases of bilateral lesions.

Current reports have shown that the modern vision testing techniques such as **potential acuity meter** and **Laser interferometer** have been used to test the neuroretinal integrity and predict visual outcome after cataract surgery^{18,19}. The limitations to this test are dense cataracts which present to us in developing countries like India. However, **critical flicker frequency**^{8,20} threshold was found to predict post-operative visual outcomes in patients with dense cataracts. These new techniques can be considered as useful adjuncts in evaluating the potential vision post cataract surgery as they become more readily available across centers in India.

Conclusion

In our study, we deduced the management protocol in our vitreo-retinal department based on the prevalence of posterior segment pathologies in patients who underwent cataract surgery at our centre. This enabled us identify the retinal pathologies which validated further

management following cataract surgery. This pre-operative assessment of posterior segment which included a detailed dilated fundus examination and ultrasonography (in eyes that precluded fundus view) helped us in collecting the near accurate visual prognosis after cataract surgery and further management of the pathology. All these factors helped us in maximizing visual outcome and avoiding patient dissatisfaction to a large extent.

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